U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
PB-296 202

Calculations and Coding of Volatile Organic Compounds (VOC) Source Emissions in New Hampshire

GCA Corp, Bedford, MA GCA Technology Div

Prepared for

Environmental Protection Agency, Boston, MA Region I

May 79

United States
Environmental Protection
Agency

Region I
J.F. Kennedy Federal Building
Boston, MA 02203

EPA-901/9-79-006
February 1979

Air

PB 296202

EPA

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NATIONAL TECHNICAL
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SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-901/9-79-006		PB296202

4. TITLE AND SUBTITLE	5. REPORT DATE
CALCULATIONS AND CODING OF VOLATILE ORGANIC COMPOUNDS SOURCE EMISSIONS IN NEW HAMPSHIRE	FEBRUARY 1979
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
STEPHEN HARVEY, MARK BORNSTEIN	GCA-TR-79-02-G
9. PERFORMING ORGANIZATION NAME AND ADDRESS GCA/TECHNOLOGY DIVISION GCA CORPORATION BEDFORD, MASSACHUSETTS 01730	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO. 68-02-2607 Work Assignment 21
12. SPONSORING AGENCY NAME AND ADDRESS EPA REGION I AIR BRANCH JFK FEDERAL BUILDING BOSTON, MASSACHUSETTS 02203	13. TYPE OF REPORT AND PERIOD COVERED FINAL
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

An inventory of volatile organic compound (VOC) emissions in the State of New Hampshire was completed. All stationary point sources for hydrocarbon emissions were identified and their actual and potential emission levels for emissions were made for 1982. Reasonable Available Control Technology (RACT) regulations were applied to industries subject to these requirements and the resulting reduction in VOC emissions for 1982 calculated. Projections for controlled actual emissions were then determined for industrial categories for the years 1982, 1987, 1990, and 1995. An error analysis was made to establish the level of reliability of the data.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
HYDROCARBONS ORGANIC COMPOUNDS EMISSION INVENTORY	NEW HAMPSHIRE REGULATIONS EMISSION LIMITATIONS	13B 13H

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Unlimited	UNCLASSIFIED	40
	20. SECURITY CLASS (This page)	22. PRICE
	UNCLASSIFIED	A03-A01

EPA Form 2220-1 (9-73)

EPH-901/9-79-006

GCA-TR-79-02-G

CALCULATIONS AND CODING OF VOLATILE ORGANIC COMPOUNDS (VOC) SOURCE EMISSIONS IN NEW HAMPSHIRE/TASK 1

Final Report

by

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May 1979

Contract No. 68-02-2607
Work Assignment No. 21

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DISCLAIMER

This Final Report was furnished to the Environmental Protection Agency by GCA Corporation, GCA/Technology Division, Burlington Road, Bedford, Massachusetts 01730, in fulfillment of Contract No. 68-02-2607, Work Assignment No. 21. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

ABSTRACT

An inventory of volatile organic compound (VOC) emissions in the State of New Hampshire was completed. All stationary point sources for hydrocarbon emissions were identified and their actual and potential emission levels for 1977 listed. Projections for unregulated actual emissions and potential emissions were made for 1982. Reasonable Available Control Technology (RACT) regulations were applied to industries subject to these requirements and the resulting reduction in VOC emissions for 1982 calculated. Projections for controlled actual emissions were then determined for industrial categories for the years 1982, 1987, 1990, and 1995. An error analysis was made to establish the level of reliability of the data.

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1.0 INTRODUCTION

This study was undertaken to establish an inventory for volatile organic compound (VOC) emissions in the State of New Hampshire. All significant stationary point sources* for VOC in New Hampshire were tabulated. Major sources having annual potential emissions in excess of 100 ton/yr were identified. Emissions for 1982, 1987, 1990, and 1995 were projected using growth factors for the various industries involved. Reduction of VOC emissions were calculated by applying RACT requirements to the industries having facilities subject to these regulations and the overall effect on total VOC emissions determined. A facility is defined as all operations falling under a specific industrial process classification at a given plant (source). For instance, a plant having several paper coaters and several degreasing units would be considered to be a single "source" having the "facilities" - surface coating of paper and degreasing. These results are summarized in tabular form in Appendix A.

Although the purpose of this study as explained above is reasonably straight forward, numerous problems were encountered. The nature, extent and method of solving each problem is discussed at various points in the body of this report. Some of the more important problems experienced were: data for present VOC emissions from point sources were assumed representative of 1977 although the data were for different years ranging from 1972 to 1978, and the processes contributing to VOC emissions were not always consistent with the Standard Industrial Classification (SIC) for that company, resulting in difficulties in classifying that source in an industrial category and the application of RACT requirements. The one major problem, however, was determining growth rates for the various industries involved in VOC emissions. Considerable discussion is dedicated to describing the methods of determining growth factors and the reliability of the results.

The projected values for VOC emissions are estimates and merely assume that recent trends will continue smoothly into the future. They cannot and do not take into account sudden changes in the industrial outlook resulting from such events as recession or unexpected shortages of raw materials. The projections do, however, give a reasonable estimate of what emissions will be at future dates barring major changes in the economy and that specific industry.

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*A source is defined as a specific plant having VOC emissions.

2.0 PRESENT EMISSION DATA

The first step in this study was to develop a list of all VOC emission stationary point sources. Values for the actual emissions from these sources were gathered from the state files. Unfortunately, this information was not available for base year, 1977 for all companies. It was subsequently agreed upon by EPA and the New Hampshire Air Pollution Control Agency to assume that the 1977 actual emissions for each company were the same as the year with the most recent data. This assumption is inconsistent with the concept of industrial growth used in projecting future emissions. It should be noted, however, that the larger the source of VOC emissions the more up-to-date the data tends to be. Most of the major sources have emission data available for either 1976 or 1977. Sources whose most recent emission data are for a year prior to 1975 contribute less than 2 percent of New Hampshire's total VOC emissions. The largest and most out-of-date source is Hermsdorf Fixture of Hillsborough County having VOC emissions of 54 tons in 1972. This emission total constitutes just over 8 percent of actual emissions contributed by the Major Industrial Group 25, Furniture and Fixtures in Hillsborough County. Ninety-eight percent of the emissions in Hillsborough County are contributed by sources for which data are available for 1975 or later. From these facts, the assumption that all data are representative of 1977 should not seriously affect the integrity of the inventory.

Using the operating hours for each company, the potential VOC emission for each source was determined. The potential VOC emission for a source is defined here as the amount of VOC that would be emitted by that source if its operating hours were increased to 24 hr/day, 365 day/yr. Potential emission is therefore dependent on the facility and its capacity and independent of the source's operating schedule. The potential emissions for a company will remain constant unless there is a facility change, (e.g., the addition of a coating line), or a process change, (e.g., an increase in coating speed).

A major source is defined as a facility having potential emissions in excess of 100 ton/yr. These sources will be subject to RACT regulations. Some inconsistencies surface with regard to this criteria, however. Some companies have a VOC emitting process which is a small step in an overall manufacturing sequence. If the operating hours of this process are presently limited, this facility may become classified as a major source of VOC emissions whereas in reality it is a relatively small source. A good example is Acme Staple Co. in Merrimack County. Although Acme is a relatively small source with 7 ton/yr actual VOC emissions, it is Merrimack County's largest source of potential emissions with 1,179 ton/yr. This problem will be discussed in a later section of this report.

A list of all stationary VOC emission sources in the State of New Hampshire appears in Appendix A, Tables 3 through 12. The names of all sources in each county are listed along with their SICs, actual emissions and calculated potential emissions, the year for which the actual emissions were reported, projected actual emissions for 1982, type of exemption (if any), reduction from RACT (if any), and net projected emissions for 1982. Those sources having more than one type of operation (facility emitting hydrocarbons) have those facilities listed separately with their corresponding emissions. All companies having a facility emitting more than 100 ton/yr have their addresses listed.

From these tables, it can be seen that three-fourths of all VOC emissions occur in Hillsborough (55.5 percent) and Rockingham (20.9 percent) counties. The remainder of New Hampshire's VOC emissions are centered in the following four counties: Strafford (8.3 percent), Cheshire (5.9 percent), Grafton (3.3 percent), and Merrimack (3.0 percent). The remaining four counties account for less than 3 percent of the State's emissions and are in decreasing order of importance: Sullivan (1.0 percent), Belknap (1.0 percent), Coos (0.7 percent), and Carrol (0.3 percent).

A review of Tables 3 through 12 reveals that six corporations are responsible for over 60 percent of New Hampshire's VOC emissions. A total of four facilities at Nashua Corporation's two plants in Hillsborough County contribute 42.1 percent of the State's emissions. Davidson Rubber in Strafford County has two plants with a total of five VOC emitting facilities accounting for 5.2 percent of the emissions in New Hampshire. The four remaining sources are single plant, single facility operations and are as follows: Mobil Oil of Rockingham County (4.1 percent), USM-Bailey of Rockingham County (3.7 percent), Atlantic Terminal of Rockingham County (3.1 percent), and Triangle Pacific of Hillsborough County (2.7 percent).

3.0 PROJECTIONS FOR VOC EMISSIONS

3.1 DETERMINING INDUSTRIAL GROWTH RATES

In order to project emissions for the years 1982, 1987, 1990, and 1995, it is necessary to establish reliable growth rates for the various industries responsible for VOC emissions. Growth in this report refers to real growth, that is increase (or decrease) in material produced.

The method derived to predict industrial growth in New Hampshire was based first on analyzing the industries of interest on a national level. Using the manual "U.S. Industrial Outlook 1977" published by the U.S. Department of Commerce,[1,2] plots were made of the wage price index, and the employment history for each industrial category. If the quantity of material produced was given, this also was plotted and compared to the adjusted total value. For most industrial categories, a growth projection to 1985 was given. Unfortunately, these projected growth values did not separate inflation from real growth in value, nor was change in value compared to growth in production. A linear regression analysis on the wage price index yielded a rough inflationary factor which could be subtracted from the predicted growth factor to give a factor for real growth in each industry. This value was compared to a real growth factor arrived at by performing a linear regression analysis on the "adjusted value" (or "quantity produced") plots. From this comparison, an approximate value for a growth factor was derived for each industry category.

Unfortunately, the only information available regarding growth in New Hampshire was the employment history.[3] Using a linear regression analysis, the employment histories of the various industrial categories in New Hampshire were compared to the national employment histories for those industries. By assuming that the production/employment relationship was the same in New Hampshire as in the nation as a whole, modified growth factors were formulated.

3.1.1 Textile Mill Products, Major Group 22

The textile industry has experienced little if any real growth between 1970 and 1975, but did expand slightly between 1967 and 1970. The Department of Commerce made no projection for growth in this industry. Based on past performance, growth can be expected to fall in the 0 to 2 percent per year range. Between 1970 and 1976, national employment in the textile industry decreased by just over 2 percent, whereas it decreased by over 4-1/2 percent in the State of New Hampshire. Real growth in New Hampshire can therefore be expected to be between -2 and 0 percent. A conservative estimate of -1 percent growth for the textile industry in New Hampshire was chosen.[1,2,3]

3.1.2 Furniture and Fixtures, Major Group 25

The wood furniture industry has been in a decline over the past 6 to 9 years. The inflation rate has been in the 5 to 7 percent range during this period. The Department of Commerce projects a growth factor of 9 percent for wood furniture (with inflation built into this figure). This prediction implies real growth in the 2 to 4 percent range, assuming no significant change in the inflationary rate for this product. Projections based on past performance of the industry are less optimistic, suggesting growth in the -2 to +1 percent range. A comparison of national and New Hampshire employment histories reveals that while there was no change in national employment between 1970 and 1976, the number of people employed in the Furniture and Fixtures category in New Hampshire decreased by more than 3 percent over this period. Keeping in mind the favorable outlook for wood furniture as predicted by the Department of Commerce, real growth for the wood furniture industry is predicted to be 1 percent per year.[1,2,3]

3.1.3 Lumber and Wood Products, Major Group 24

Because of the small number of sources of VOC emissions in this category, a full analysis was not performed. It was assumed that real growth will roughly parallel that of the wood furniture industry. A value of 1 percent annual growth is assumed.

3.1.4 Paper and Allied Products, Major Group 26

This industry has been growing at a rate of 1 to 3 percent between 1967 and 1976. The Department of Commerce's projected growth, not accounting for inflation, is 8 percent. This value corresponds to a real annual growth of 0 to 1 percent. The paper industry in New Hampshire has been far more active than in the rest of the country. Whereas national employment was relatively steady between 1970 and 1976, employment in the paper industry in New Hampshire was increasing by over 4 percent per year. In light of this fact, the projected annual growth rate for Paper and Allied Products in New Hampshire is estimated to be 3 percent.[1,2,3]

3.1.5 Printing and Publishing, Major Group 27

Because values for the Wage Price Index were not given in "U.S. Industrial Outlook 1977", it is difficult to assess real growth in this industry. From information in the text, it appears that real growth was between 0 and 3 percent per year between 1967 and 1976. The projected growth, not accounting for inflation is 8 percent, corresponding to 1 to 3 percent real growth. Employment in New Hampshire between 1970 and 1976 increased at an annual rate of more than 1 percent, whereas there was no significant increase in the number of employees over this period nationwide. From this information, a growth rate of 2 percent was assumed.[1,2,3]

3.1.6 Rubber and Miscellaneous Plastic Products, Major Group 30

This industry experienced solid growth between 1967 and 1976, with real annual growth in the 3 to 5 percent range. Inflation, however, has been steep, averaging in the 7 to 9 percent range between 1970 and 1976, but averaging

close to 14 percent between 1973 and 1976. Growth projections to 1985 predict little if any real growth in this industry. The employment history shows an average annual decline of 1.3 percent between 1970 and 1976 nationwide. In New Hampshire, however, growth has been well above the national level, which, as noted previously, was substantial. Employment increased by an annual average rate of 3 percent over the mentioned period. Based on this fact, an annual growth projection of 2 percent was assumed.[1,2,3]

3.1.7 Leather and Leather Products, Major Group 31

Real growth in this industry has been in the 0 to 2 percent per year range. The Department of Commerce's projection of 8 percent annual growth implies a real annual growth of 0 to 1 percent after inflation. Between 1970 and 1976, the national employment in the leather industry held steady, while the number of people employed in New Hampshire's leather industry decreased by more than 6-1/2 percent per year. A conservative estimate of -2 percent was taken as this industry's annual growth rate in New Hampshire.[1,2,3]

3.1.8 Primary Metal, Major Group 33

The primary metal industry has been extremely erratic in recent years. Between 1970 and 1977, there was an average annual growth rate between 1 and 2 percent. The industry's major growth, however, occurred between 1970 and 1974, while the average annual growth between 1974 and 1977 was -12 percent. The Department of Commerce's projection for growth reflects the uncertain nature of the industry, given as a range of 8 to 13 percent. Taking inflation into account, projected growth can be expected to fall between -4 and +2 percent. National employment in this industry declined annually by over 1 percent between 1970 and 1976, however, in New Hampshire it increased by more than 2-1/2 percent per year. It is therefore assumed that growth of the primary metal industry in New Hampshire will be at the high end of the projected range, or +2 percent.[1,2,3]

3.1.9 Fabricated Metal Industry, Major Group 34

This industry has shown no significant growth since 1967 and between 1973 and 1976 was in a decline for structural metal parts. The Department of Commerce's projection for growth is in the 7 to 9 percent range. Taking inflation into account, this industry is not expected to grow significantly, and may decline between 1977 and 1985. Employment nationwide increased by 1 percent between 1970 and 1976.

Ironically, fabricated metals has been one of New Hampshire's fastest growing industries. Employment between 1970 and 1976 increased at an annual rate of close to 9 percent. The unfavorable national outlook suggests that expansion of this industry in New Hampshire will taper off somewhat, but a real growth rate of 6 percent per year does not seem unreasonable.[1,2,3]

3.1.10 Electrical Equipment and Supplies, Major Group 36

Real growth in this industry has been large, averaging in the 4 to 6 percent range annually in the 6 to 9 years leading up to 1976. The inflationary rate, unlike most other industries, has been practically negligible in recent

years, ranging between -1 and +2 percent annually for most product lines. Projections based on the Department of Commerce's predictions suggest continued growth in the 3 to 5 percent range. National employment between 1970 and 1976 decreased at an annual rate of 0 to 2 percent.

The State of New Hampshire's electronics industry did not enjoy the same level of growth that the rest of the country enjoyed. Employment between 1970 and 1976 declined at a rate of over 3-1/2 percent per year. Given the favorable outlook of the industry as a whole, long term growth is expected in New Hampshire. This growth, however, will be below the national level. The assumed growth rate for this industry is 2 percent.[1,2,3]

3.1.11 Machinery Except Electrical, Major Group 35

This category is a minor contributor to VOC emissions and was not analyzed in depth. It is assumed here that growth will parellel that for the electrical equipment industry and primary metal industry, and lag behind the rapidly expanding fabricated metal industries. A rough estimate of 2 percent is assumed for the annual real growth rate for this industry in New Hampshire.[1,2]

3.1.12 Petroleum Storage, Major Group 51

It is assumed that long term growth of petroleum storage will roughly parallel overall industrial growth in the State. A conservative estimate of 2 percent is assumed for this category.

3.1.13 Dry Cleaning, Group 7216

Dry cleaning in New Hampshire experienced rapid decline between 1970 and 1976, with employment decreasing at an average rate of approximately 11 percent. The number of facilities also declined at a rate of about 7 percent per year. The industry appeared to be levelling out towards the end of this period and employment actually increased by 6 percent between 1975 and 1976. It is assumed here that the most severe ramifications resulting from the synthetic fabric industry have occurred and further decline in the industry from the increased popularity of "wash-and-wear" products will be offset by population growth. A growth factor of 0 percent is therefore assumed.[3]

3.1.14 Optical Goods, Major Group 38

There is only one source in New Hampshire in this category. Growth rate in this industry is assumed to be the same as that for the nation, which is projected to be about 6 percent per year in real growth.[1,2]

3.1.15 Summary

Table 1 summarizes the various industries contributing to VOC emissions in New Hampshire. The assumed growth rate is listed along with 1977 actual emissions and percentage of New Hampshire's emissions for each industrial category.

TABLE 1. INDUSTRY CATEGORIES CONTRIBUTING TO VOC EMISSIONS IN NEW HAMPSHIRE

SIC	Category	Assumed, annual growth rate, %	Actual emissions in 1977, tons	Percent of New Hampshire's total 1977 emissions
26	Paper and Allied Products	+3	8,438	49.3
30	Rubber and Misc. Plastic Products	+2	2,933	17.1
51	Petroleum Storage	+2	1,889	11.0
25	Furniture and Fixtures	+1	972	5.7
36	Electrical Equipment and Supplies	+2	617	3.6
22	Textile Mill Products	-1	518	3.0
7216	Dry Cleaning	0	447	2.6
31	Leather and Leather Products	-2	437	2.6
35	Machinery Except Electrical	+2	239	1.4
34	Fabricated Metal	+6	218	1.3
24	Lumber and Wood Products	+1	160	0.9
38	Optical Goods	+6	103	0.6
27	Printing and Publishing	+2	74	0.4
33	Primary Metal	+2	63	0.4

3.2 PROJECTED EMISSIONS

It is assumed that VOC emissions will increase directly with production. Emissions were therefore tabulated by industrial category for the State of New Hampshire and estimates for VOC emissions for 1982 made for each of these categories. Projections for actual emissions appear in Table 13.

3.2.1 Application of RACT

A number of sources in New Hampshire having potential emissions in excess of 100 ton/yr will be subject to Reasonable Available Control Technology, (RACT), requirements. Sources having one or more facilities which have been specified as subject to RACT regulations and exceed 100 ton/yr of potential emissions will be required to reduce their emissions. Those facilities subject to RACT requirements were identified and the reductions resulting from the application of RACT standards calculated. The reduction for most operations, (predominantly surface coating operations), is 81 percent overall - 90 percent capture or containment efficiency and 90 percent efficiency in the control device. The assumed reduction for degreasing operations is 60 percent. It is assumed that in all cases that vapor degreasing is employed. For petroleum storage, the installation of a floating roof results in approximately 90 percent reduction in VOC emissions. These values were used to calculate reductions resulting from the application of RACT to the facilities subject to these requirements.

RACT requirements were applied only to facilities having potential emissions in excess of 100 ton/yr in 1977. No attempt was made to apply RACT to facilities which are projected to exceed this limit in a future year prior to 1995. No facility having potential VOC emissions less than 100 ton/yr is projected to exceed this limit by 1982.

After reducing the 1982 emissions by applying RACT and listing this value for each industry in Tables 3 through 12, emissions for 1987, 1990, and 1995 were projected by applying the growth factor for each industry to the reduced emission value. The results are tabulated by industrial category in Table 13.

3.2.2 Reduced Operating Hours

As mentioned in an earlier section, there are sources in New Hampshire with relatively low actual VOC emissions but, because of their limited operating schedule, are considered major sources, (potential emissions in excess of 100 ton/yr). It has been suggested that rather than applying RACT to these facilities, the companies can make an agreement with the State of New Hampshire to limit their operating hours. A number of industries have been determined eligible by the State of New Hampshire for such a system. These companies have a subscript C (permit conditions) in the "Exempted from Control" column in Tables 3 through 12.

4.0 CONCLUSION

It is important to the results of this report that the reliability of the information presented here be understood. Since a large part of this study deals with predicting future events, the data based on such predictions are understandably suspect. There are other sources of error, but none are nearly as important as the error involved in attempting to project growth up to 18 years into the future. For this reason, the error analysis presented here will concentrate on this aspect.

4.1 ERROR ANALYSIS

Because the nature of growth is depicted as being exponential in nature, the severity of an error resulting from a miscalculation of a growth rate increases exponentially with the number of years for which that growth rate is used. To determine the extent of a projection error, it is necessary to establish the error factor. The error factor is defined here as the ratio of the actual growth factor and the projected growth factor. For example, if a 3 percent growth is projected, but the actual growth rate turns out to be 2 percent, the growth factors are 1.03 and 1.02, respectively, and the resulting error factor is 0.990, (1 percent error).

Figure 1 is a graphical representation of the error factor as a function of actual and projected growth rates. These lines are not actually parallel, but have a common intercept at -100, 0. In the range of growth rates commonly encountered in industry, however, the lines can be assumed parallel with minimal error. A simplified version of Figure 1 is shown in Figure 2, which employs this concept. The implication behind this simplification is that the percent error in a miscalculated growth rate is simply equal to the difference between the actual growth rate and the projected value. For example, if a projected growth rate is 4 percent, and the actual rate is 2 percent, the percent error in this calculation is roughly -2 percent, (actual error is -1.923 percent). This concept allows quick and accurate assessment of error severity.

Once the error factor is known, the error in a projected value can be determined by exponentially expanding the error factor by the number of years involved in the projection. The formula is simply:

$$PE = |EF^{y} - 1| \times 100 \qquad (1)$$

where PE = Projection error, percent

EF = Error factor

y = Number of years covered by projection

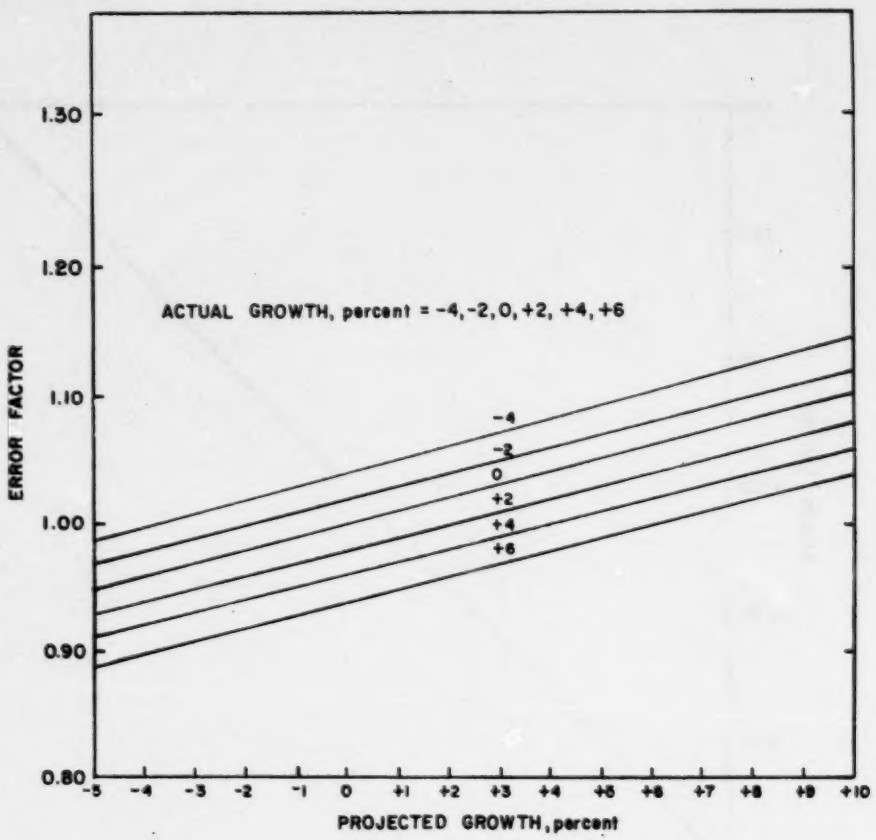

Figure 1. Growth Rate Error Factor.

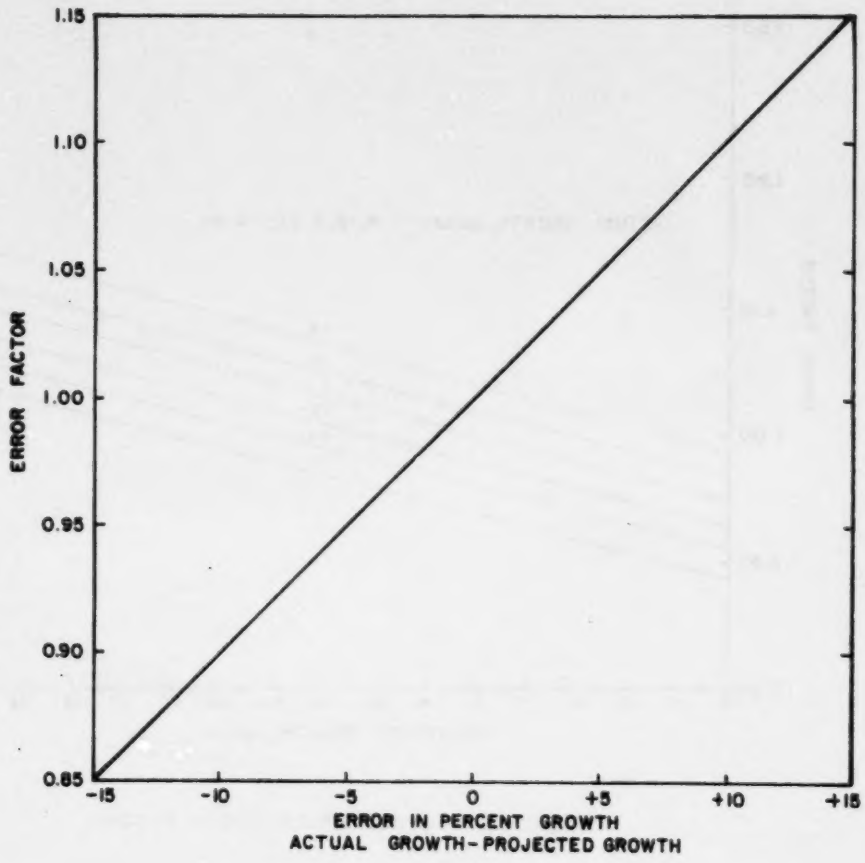

Figure 2. Approximate Growth Rate Error Factor.

For example, using the former example of a projected growth rate of 4 percent, (for an actual growth of 2 percent), to project an annual emission rate 10 years into the future will result in an 18 percent error in the projected value. Figure 3 is a graphical representation of Equation (1). Figure 3 can be used to generate Table 2, which gives perspective to an analysis of accuracy and reliability of projected values.

TABLE 2. PROJECTION ERROR

Difference (actual growth-projected growth)	Error factor	Number of years in projection	Percent error in projected value
-1	0.99	5	5
-1	0.99	10	9
-1	0.99	15	14
+1	1.01	5	5
+1	1.01	10	10
+1	1.01	15	16
-2	0.98	5	9
-2	0.98	10	18
-2	0.98	15	26
+2	1.02	5	10
+2	1.02	10	22
+2	1.02	15	34
-4	0.96	5	18
-4	0.96	10	34
-4	0.96	15	46
+4	1.04	5	22
+4	1.04	10	48
+4	1.04	15	80

It is felt that for most industries, the projected growth rate will be within ±2 of the actual growth rate, particularly the more important VOC emitters in New Hampshire. For example, the paper industry has a projected growth of +3 percent, and it is believed doubtful that actual growth will fall outside the range +1 to +5 percent. Under this assumption, the maximum error for an 18 year projection is 43 percent.

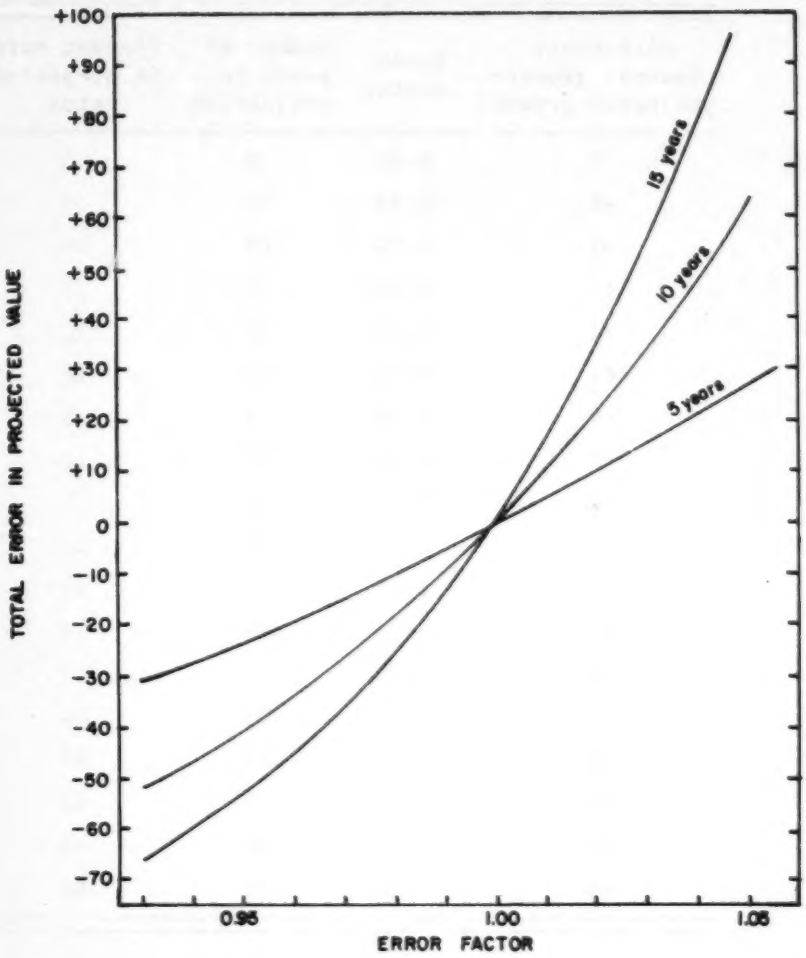

Figure 3. Projection Error.

4.2 SUMMARY

It is believed that the results presented in this report represent a reasonably accurate depiction of New Hampshire's emissions. There are obvious weaknesses in a study which sets out to accomplish what this investigation was designed to do. Many have been mentioned or discussed, others have not. Note, for instance, that growth predictions could not and did not attempt to account for new industries belonging to an industrial category not already present in that county. As long as the limitations and possible sources of error are understood, this investigation can provide useful information regarding present and future VOC emissions in the State of New Hampshire.

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APPENDIX A

VOC EMISSIONS FOR NEW HAMPSHIRE COUNTIES

TABLE 3. VOC EMISSIONS FOR BELKNAP COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category: Facility	Actual TPY	Potential TPY	Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
Allen-Rodgers Corp. 54 Water Street Laconia, N.H. 03246	2500	1977	S.C.* - wood furniture	32	139	34	c	0	0	34
Bergeon-Patterson Pipe Support	3400	1976	S.C. - other metal products	17	39	22	a	0	0	22
			Degreasing	37	84	49	a	0	0	49
			Total	54	123					
Laconia Shoe	3141	1974	S.C. - other	20	80	18	a	0	0	18
Quin-T	2661	1976	S.C. - other	52	316	60	c	0	0	60
Scott-Williams		1976	Degreasing	5	22	6	a	0	0	6
Total				163	680	189			0	189

*S.C. - Surface Coating

a - less than 100 TPY potential
b - exempt solvent
c - permit conditions
d - process unregulated

TABLE 4. VOC EMISSIONS FOR CARROLL COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
			Facility	Actual TPY	Potential TPY					
Yield House Whittier, Inc. W. Ossippee, N.H. 03890	2511	1975	S.C. - wood furniture	55	241	58	c	0	0	58
Total				55	241	58			0	58

TABLE 5. VOC EMISSIONS FOR CHESHIRE COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982, actual TPY
			Facility	Actual TPY	Potential TPY					
Howard Pine, Inc.		1975	S.C. - wood furniture	5	73	5	a	0	0	5
C.L. Lane Co. East Swanzey, N.H. 03446	2445	1973	S.C. - other	30	117	32	c	0	0	32
MacBick		1974	S.C. - paper	6	25	7	a	0	0	7
Markem Corp. 150 Congress St. Keene, N.H. 03431	2600	1976	S.C. - paper	427	1,142	495		81	401	94
Marlboro Mfg. 69 Island St. Keene, N.H. 03431	2511	1975	S.C. - wood furniture	96	374	101		81	82	19
NPB	3562	1976	Degreasing	128	640	141	b	0	0	141
Troy Mills, Inc. Troy, N.H. 03465	2231	1975	S.C. - fabric	275	803	262		81	212	50
Whitney Bros. Water St. Marlborough, N.H. 03455	2500	1977	S.C. - wood furniture	45	263	47	c	0	0	47
Total				1,012	3,447	1,094			695	395

TABLE 6. VOC EMISSIONS FOR COOS COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982, actual TPY
			Facility	Actual TPY	Potential TPY					
Converse Rubber W. Milan Rd. Berlin, N.H. 03570	3021	1977	Adhesives	81	191	*	*	*	*	*
Nuroco Brown St. Whitefield, N.H. 03598	2500	1977	S.C. - wood furniture	37	171	39	c	0	0	39
Tillotson Rubber		1977	Degreasing	1	18	1	a	0	0	1
Total				119	380	40		0	0	40

*Out of business in 1979.

TABLE 7. VOC EMISSIONS FOR GRAFTON COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net Projected emissions in 1982, actual TPY
			Facility	Actual TPY	Potential TPY					
International Packings Corp. Ragged Mt. Hwy. Bristol, N.H. 03222	3069	1977	Adhesives	441	619	487		81	395	92
MPB	3562	1975	Degreasing	15	34	17	a	0	0	17
Plymwood Furniture Co. Lisbon, N.H. 03585	2511	1978	S.C. - wood furniture	25	110	26	c	0	0	26
Rockwell International Beebe River, N.H. 03129	2500	1978	S.C. - wood furniture	45	180	47	c	0	0	47
Sweet Wood Handle Bethlehem Road Littleton, N.H. 03561	2500	1974	S.C. - wood furniture	37	182	39	c	0	0	39
Total				563	1,125	616			395	221

TABLE 8. VOC EMISSIONS FOR HILLSBOROUGH COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982, actual TPY
			Facility	Actual TPY	Potential TPY					
Amoskeag Leather Finishing		1974	S.C. - other	4	7	4	a	0	0	4
Batesville Casket Co. 55 Palm St. Nashua, N.H. 03060	3995	1977	S.C. - wood furniture	120	505	126		81	102	24
Beebe Rubber Co.	3069	1975	Adhesives	60	88	66	a	0	0	66
Bronze Craft		1976	Degreasing	4.5	41	5	a	0	0	5
			S.C. - Other metal products	3.5	16	4	a	0	0	4
			Total	8	57					
Centronic Data		1974	Degreasing	10	22	11	a	0	0	11
Crystal Cleaners, Inc. 213 Union St. Manchester, N.H.	7216	1976	Dry Cleaning	31	104	31	c	0	0	31
Disogrin Industries Grenier Field Manchester, N.H. 03103	3400	1976	Degreasing	18	66	20	a	0	0	20
			S.C. - Other metal products	10	36	11	a	0	0	11
			Total	28	102					
Dry Cleaners (25)	7216	1976	Dry Cleaning	111	375	111	a	0	0	111
Edison Electronics		1972	Degreasing	14	34	15	a	0	0	15
ESC Inc.		1975	S.C. - other	10	78	11	a	0	0	11
Gates, Inc.		1977	S.C. - wood furniture	5	16	6	a	0	0	6
GTE Sylvania W. Main St. Hillsboro, N.H. 03244	3699	1977	Degreasing	43	188	48	c	0	0	48

(continued)

TABLE 8 (continued).

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to RACT	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982, actual TPY
			Facility	Actual TPY	Potential TPY					
GTE Sylvania 655 S. Willow St. Manchester, N.H. 03103	3699	1977	Other solvent use	34	155	38	c	0	0	38
Gulton Industries		1974	S.C. - other metal products	2	9	2	a	0	0	2
Hampshire Manufacturing Corp. Factory St. Nashua, N.H. 03060	3021	1975	S.C. - fabric	71	311	78	c	0	0	78
Hermsdorf Fixture Mfg. Co. 106 Franklin St. Manchester, N.H.	2542	1972	S.C. - wood furniture	54	237	57	c	0	0	57
Hillsboro Uniform		1976	Dry Cleaning	4	19	4	a	0	0	4
Horton Hubbard		1976	Adhesives	6	27	7	a	0	0	7
Imperial Cleaners		1976	Dry Cleaning	8	19	8	a	0	0	8
International Paper Box Machine	3554	1974	S.C. - other metal products	8	35	10	a	0	0	10
Interstate Uniform Rental Service Industrial Park Drive Nashua, N.H. 03060	7216	1977	Dry Cleaning	110	482	110	a	81	89	21

(continued)

TABLE 8 (continued).

Company name (address)		Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
			Facility	Actual TPY	Potential TPY					
Irwin Toys		1977	S.C. - other	8	34	8	a	0	0	-
Lyons Iron Works		1976	S.C. - other metal products	4	9	4	a	0	0	-
The Main Mfg. Co.		1976	S.C. - other metal products	14	64	18	a	0	0	-
JF. McElwain Co. 415 Silver St. Manchester, N.H. 03103	3143	1975	S.C. - other	24	110	22	c	0	0	-
Modutec, Inc.	3611	1974	S.C. - other metal products	5	11	6	a	0	0	-
Nashua Corp. Rte. 3 Merrimack, N.H. 03054	2649	1977	Industrial Process - other	75	110	87	c	0	0	-
			S.C. - paper	4,550	10,506	3,275	c	81	4,273	-
			S.C. - other metal products	80	117	93	c	0	0	-
			Total	4,705	10,733					
Nashua Corp. 44 Franklin St. Nashua, N.H. 03060	2649	1977	S.C. - paper	2,500	4,771	2,878	c	81	2,347	-
New England Bobbin and Shutre		1974	S.C. - other	6	53	7	a	0	0	-
Pilgrim Furniture		1974	S.C. - wood furniture	6	27	7	a	0	0	-
Prevue Products 195 McGregor St. Manchester, N.H. 03102	3021	1978	S.C. - other	289	879	319		81	258	-
Raytheon Co.		1974	S.C. - other	10	45	11	a	0	0	-
Sanders Associates, Inc. Grenier Field, N.H. 03103	7391	1976	Degreasing	51	618	56	c	0	0	-

(continued)

TABLE 8 (continued).

Company name (address)	SIC	Year data taken	Total VOC by facility category: Facility	Actual TPY	Potential TPY	Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982, actual TPY
Seal Tanning Co. P.O. Box 96 Manchester, N.H. 03105	3111	1976	S.C. - other	334	1,537	302		81	245	57
Security Heel		1974	S.C. - other	16	73	17	a	0	0	17
Sprague Electric Factory St. Nashua, N.H. 03060	3679	1976	Degreasing	51	106	56	c	0	0	56
			S.C. - Fabric	26	95	29	c	0	0	29
			Total	77	201					
Sta-Hi 8 Capital St. Nashua, N.H. 03060	3555	1976	Degreasing	4.5	52	5	a	0	0	5
			S.C. - other	4.5	52	6	a	0	0	6
			Total		104					
Standard Uniform Rental	7216	1976	Dry Cleaning	7	13	8	a	0	0	8
Triangle Pacific Cabinets 25 Crown St. Nashua, N.H. 03060	2511	1976	S.C. - wood furniture	456	1,000	479		81	388	91
Velcro USA, Inc. 406 Brown Ave. Manchester, N.H. 03108	2241	1976	S.C. - Fabric	243	1,064	236		81	191	45
Wilton Pressed Metals		1974	S.C. - other metal products	5	22	6	a	0	0	6
Total				9,510	24,238				7,893	2,845

TABLE 9. VOC EMISSIONS FOR MERRIMACK COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
			Facility	Actual TPY	Potential TPY					
Acme Staple Co., Inc. N. Main St. W. Franklin, N.H. 03235	3579	1977	S.C. - other metal products	7	1,179	7	c	0	0	7
Atlantic Laminates, Inc. N. Main St. Franklin, N.H. 03235	3079	1978	S.C. - fabric	250	800	276		81	224	52
Carpenter and Patterson		1976	S.C. - other metal	2	9	2	a	0	0	2
Dry Cleaners (12)	7216	1976	Dry Cleaning	47	170	47	a	0	0	47
Elktrisola		1976	S.C. - magnetic wire	25	30	27	a	0	0	26
Emerson Lounge Co. Frank and Main St. Suncook, N.H. 03275	2512	1975	S.C. - wood furniture	37	162	39	c	0	0	39
National Northeast Fiberglass Corp. P.O. Box 876 Catoocook, N.H. 03229	3079	1977	Plastic Products Mfg.	28	125	30	d	0	0	30
Northeast Electronics		1974	S.C. - other metal products	2	12	2	a	0	0	2
Page Belt Co. 26 Commercial St. Concord, N.H. 03301	3111	1976	S.C. - fabric	29	127	32	c	0	0	31
Profile Electronics		1974	S.C. - other metal products	3	12	3	a	0	0	3
Rumford Press 10 Ferry St. Concord, N.H. 03301	2751	1977	Graphic Arts	74	111	82	d	0	0	82
Seth Thomas		1974	S.C. - wood furniture	8	47	8	a	0	0	8
Total				512	2,784	555			224	329

TABLE 10. VOC EMISSIONS FOR ROCKINGHAM COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category: Facility	Actual TPY	Potential TPY	Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
Atlantic Terminal Corp.	5171	1977	Petroleum Storage - other	528	528	583		90	525	58
Colonial Cleaners 138 Bartlett St. Portsmouth, N.H. 03801	7216	1976	Dry Cleaning	44	185	44	c	0	0	44
Data General		1976	Degreasing	15	63	17	a	0	0	17
Dry Cleaners (17)	7216	1976	Dry Cleaning	60	160	60	a	0	0	60
Emerson Lounge		1974	S.C. - furniture	3	13	3	a	0	0	3
Essex International Macallen and Suffex Plants Bay Road Newmarket, N.H. 03857	1793	1976	S.C. - paper	399	620	463		81	375	88
Fuel Storage Corp. Patterson Lane Newington, N.H. 03801	5172	1975	Petroleum Storage - other	228	228	251	d	0	0	251
Ideal Tape Co. Industrial Pk. Exeter, N.H. 03833	2641	1976	S.C. - paper	260	380	302		81	245	57
Kingston Steel Drum Co. Haverhill Road Kingston, N.H. 03848	3412	1976	S.C. - other metal products	40	156	54	c	0	0	54
Kingston-Warren Corp. Swampscott St. Newfield, N.H. 03856	3000	1977	Degreasing	103	470	113		60	62	51
				41	187	45	c	0	0	45
			Total	144	657					
Mobil Oil Newington, N.H.	5171	1975	Gasoline and crude oil storage	700	700	773		90	696	77
Northeast Petroleum Corp. Portsmouth, N.H.	5172	1975	Petroleum Storage - other	333	333	368	d	0	0	368

(continued)

TABLE 10 (continued).

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
			Facility	Actual TPY	Potential TPY					
Public Service Newington, N.H.	5172	1977	Crude oil storage	100	100	368	d	0	0	111
Simplex Wire and Cable		1975	Degreasing	72	75	79	a	0	0	79
TME - Salem		1975	S.C. - fabric	8	35	10	a	0	0	10
USM - Bailey USM Corp. Bailey Division Rte. 7 Seabrook, N.H. 03874	3069	1975	S.C. - other	626	952	691	d	0	0	691
Work Plate Systems		1974	S.C. - metal furniture	5	42	6	a	0	0	6
Xentex Corp.	3079	1975	Other solvent use	20	84	22	a	0	0	22
Total				3,585	5,311	3,995			1,903	2,092

TABLE 11. VOC EMISSIONS FOR STRAFFORD COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category: Facility	Actual TPY	Potential TPY	Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
Action Industries P.O. Box 356 Gronic, N.H. 03867	2600	1978	S.C. - paper	89	390	103		81	83	18
Clarostat Mfg. Co., Inc. Washington St. Dover, N.H. 03820	3611	1975	Degreasing	30	131	33	c	0	0	33
Davidson Rubber Industrial Park Dover, N.H. 03820	3069	1977	S.C. - other	204	462	224	d	0	0	224
			Degreasing	14	64	17	a	0	0	17
			Total	218	526					
Davidson Rubber Rte. 11 Farmington, N.H. 03835	3079	1977	S.C. - other	483	1,058	537	d	0	0	532
			Degreasing	156	342	173		60	104	69
			Industrial Process - other	33	72	37	a	0	0	37
			Total	672	1,472					
Dry Cleaners (13)	7216	1976	Dry Cleaning	25	73	25	a	0	0	25
General Electric Co. 130 Main St. Somersworth, N.H. 03878	3611	1977	Degreasing	165	330	182		60	109	73
			S.C. - other metal products	130	260	144		81	117	28
			Total	295	590					
Great Falls Products		1975	Degreasing	5	11	6	a	0	0	6
Miller Shoe	3144	1975	Adhesives	17	78	15	a	0	0	15
Moore Business Forms 121 Broadway Dover, N.H. 03820	3555	1976	S.C. - other metal products	12	51	13	a	0	0	13
			Degreasing	55	116	61	c	0	0	61
			Total	67	167					
Selburne Shoes		1975	S.C. - other	9	39	8	a	0	0	8
Total				1,427	3,477	1,573			413	1,160

TABLE 12. VOC EMISSIONS FOR SULLIVAN COUNTY

Company name (address)	SIC	Year data taken	Total VOC by facility category			Projected actual VOC TPY, 1982	Exempted from control primarily due to:	% Emission reduction due to RACT	Emission reduction in 1982 due to RACT, actual TPY	Net projected emissions in 1982 actual TPY
			Facility	Actual TPY	Potential TPY					
American Optical Rte. 12 Charlestown, N.H. 03603	3851	1978	Degreasing	103	116	138	b	0	0	138
Sturm-Ruger & Co., Inc. Pine Tree Castings Guild Road Newport, N.H. 03773	3400	1977	Degreasing	63	108	84	d	0	0	84
Topstone		1975	S.C. - wood furniture	9	49	9	a	0	0	9
Total				175	273	231			0	231

TABLE 13. ACTUAL AND PROJECTED EMISSIONS FOR NEW HAMPSHIRE

SIC	Source category	Base year 1977 (tons	1982			Projected 1987 based on net 1982 and growth factors (tons)	Projected 1990 based on projected 1987 and growth factors (tons)	Projected 1995 based on projected 1990 and growth factors (tons)
			Emissions based on growth factors (tons)	Reduction from CTG for 100 ton potential and larger facilities (-tons)	Net allowable emissions (tons)			
26	Paper and Allied Products	8,438	9,782	7,724	2,058	2,386	2,607	3,022
30	Rubber and Misc. Plastic Products	2,933	3,238	1,043	2,195	2,423	2,572	2,839
51	Petroleum Storage	1,889	2,086	1,221	865	955	1,014	1,118
25	Furniture and Fixtures	972	1,022	470	552	578	597	626
36	Electrical Equipment and Supplies	617	681	226	455	503	533	589
22	Textile Mill Products	518	493	403	95	90	87	83
7216	Dry Cleaning	447	447	89	358	358	358	358
31	Leather and Leather Products	437	395	245	150	136	128	116
35	Machinery Except Electrical	239	264	0	264	291	310	341
34	Fabricated Metal Products	218	292	0	292	389	464	623
24	Lumber and Wood Products	160	168	0	168	176	181	193
38	Optical Goods	103	138	0	138	186	221	296
27	Printing and Publishing	74	82	0	82	91	96	106
33	Primary Metal	63	70	0	70	78	82	91
	Total	17,108	19,158	11,421	7,742	8,640	9,250	10,401